



Potential Methods for Alleviating Symptoms of Bruxism

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ABSTRACT

Bruxism is a condition characterized by excessive grinding and clenching of teeth especially during sleep, but symptoms can also occur during the day. Bruxism causes fatigue, feelings of sleeplessness, increased muscle tension and pain in the chewing muscle area. Despite its high prevalence in the adult population (it is believed to occur in up to one-third of people), we do not know the exact path of mechanism behind the disease, and treatment methods are not clearly defined. Treatment methods used include drug therapies, biofeedback, kinesitherapy, physiotherapy, intramuscular and intra-articular injections, psychological therapy, and treatment with intraoral devices. In addition, the exact diagnostic pathway and the way how to classify the severity of bruxism symptoms have not been determined. There is still no answer to the question of what procedure to introduce in a patient who is experiencing symptoms of bruxism despite full dental rehabilitation. The age at which treatment should begin also remains unclear. Further research is needed on the etiology of bruxism, as well as the development of uniform recommendations for diagnosis and therapy.

Key Words: Bruxism, Sleep bruxism, Bruxism treatment, Awake bruxism, Bruxism causes, Bruxism in adults, Bruxism in children, Bruxism in general diseases, Bruxism diagnosis, Teeth grinding, Teeth clenching

INTRODUCTION

Bruxism occurs in between 8% and 31.4% of the population, with sleep bruxism predominating. ¹ The prevalence of awake bruxism in adult patients is 15.44%. ²

In 2013, bruxism was defined as repetitive movements of the muscles of mastication occurring with clenching, or grinding of the teeth, and/or pushing or stiffening of the jaw occurring as sleep or awake bruxism. An additional gradation of bruxism severity suggested by experts is referred to as possible/probable/ definite sleep or awake bruxism. ³ Risk factors already present in children that could potentially influence the occurrence of bruxism in the future have been identified. These include male gender, genetics, incorrect body position, mobility, anxiety, neurosis, psychological reactions, responsibility, being a passive smoker, loud snoring,

restless sleep, sleeping with lights on, noisy surroundings, sleep shortened to less than 8 hours a day, headaches, biting objects, peer problems, emotional symptoms, and mental illness. ⁴ Type A behavior and stress in combination are more likely to develop bruxism than either of them separately. ⁵ A factor complicating diagnosis is the association of bruxism with temporomandibular joint disorders. People with bruxism are noted to have an increased risk of temporomandibular joint pathology. ⁶ Increased odds of teeth crowding have also been shown, while bruxism has not been linked to the occurrence of other malocclusions. ⁷ Sleep bruxism occurs at 40.1% of people with PTSD (post-traumatic stress disorder). ⁸ Awake bruxism is often challenging to diagnose by clinicians especially in children since they cannot always determine stress situations. ⁹ This paper is a review of scientific papers published to date. In purpose to create this article,

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literature review was conducted. In order to create this paper, a search in the PubMed database (as of 05.2024) using the key words “bruxism”, “sleep bruxism”, “bruxism treatment”, “awake bruxism”, “bruxism causes”, “bruxism in adults”, “bruxism in children”, “bruxism in general diseases”, “bruxism diagnosis”, “teeth grinding”, “teeth clenching” was conducted and scientific papers were selected and subjected to

comparative analysis. The scientific papers published to date were reviewed and analyzed. The work discusses the most commonly cited potential causes of the condition, as well as both pharmacological and non-pharmacological treatment options for patients with bruxism that are referred to in publications as bruxers.

Literature review

Author/s	Title	Conclusion
G.J. Lavigne, S. Khoury, S.Abe, T. Yamaguchi, K.Raphael	Bruxism physiology and pathology: an overview for clinicians.	Most common causes of AB are nervous tension, stress, anxiety disorders and chronic stress.
Fritzen VM, Colonetti T, Cruz MVB, Ferraz SD, Ceretta L, Tuon L, DA Rosa MI, Ceretta RA.	LEVELS OF SALIVARY CORTISOL IN ADULTS AND CHILDREN WITH BRUXISM DIAGNOSIS: A SYSTEMATIC REVIEW AND META-ANALYSIS	Saliva cortisol levels were higher in patients diagnosed with bruxism.
Polmann H, Réus JC, Massignan C, Serra-Negra JM, Dick BD, Flores-Mir C, Lavigne GJ, De Luca Canto G.	Association between sleep bruxism and stress symptoms in adults: A systematic review and meta-analysis.	Biomarkers like epinephrine, nor-epinephrine, cortisol, dopamine and prolidase have been shown to be associated with sleep bruxism.
Alam MK, Alsharari AHL, Shaye MAL, Elfadil S, Cervino G, Minervini G.	Prevalence of bruxism in down syndrome patients: A systematic review and meta-analysis.	1. Bruxism is more common in patients with Down syndrome.
Kammer PV, Moro JS, Soares JP, Massignan C, Phadraig CMG, Bolan M.	Prevalence of tooth grinding in children and adolescents with neurodevelopmental disorders: A systematic review and meta-analysis.	Excessive clenching or grinding of teeth occurs in children and adults with neurodevelopmental, but studies must be further expanded.
Macedo CR, Silva AB, Machado MA, Saconato H, Prado GF.	Occlusal splints for treating sleep bruxism (tooth grinding).	Studies do not show a statistically significant advantage of occlusal splints, but they can be an effective in preventing teeth abrasion.
Naumann M, Jankovic J.	Safety of botulinum toxin type A: a systematic review and meta-analysis.	Botulinum toxin is a drug with a high safety profile and low adverse effects.
Chen Y, Tsai CH, Bae TH, Huang CY, Chen C, Kang YN, Chiu WK. Effectiveness of Botulinum	Toxin Injection on Bruxism: A Systematic Review and Meta-analysis of Randomized Controlled Trials.	Botulinum toxin produces effects of reducing bite force, as well as pain intensity lasting up to 24 weeks.
Cheng Y, Yuan L, Ma L, Pang F, Qu X, Zhang A.	Efficacy of botulinum-A for nocturnal bruxism pain and the occurrence of bruxism events: a meta-analysis and systematic review.	The degree of recurrence of the teeth-clenching phenomenon and pain after botulinum toxin effects has stopped, has not been documented.
Baba K, Haketa T, Clark GT, Ohshima T.	Does tooth wear status predict ongoing sleep bruxism in 30-year-old Japanese subjects?	Previously published studies indicate that the degree of teeth damage does not always correlate with the severity of bruxism.
Lee A, He LH, Lyons K, Swain MV.	Tooth wear and wear investigations in dentistry.	Due to its multifactorial origin and symptoms of varying degrees of severity, it is often impossible to determine the unequivocal cause of bruxism, and at the time of treatment

Macedo CR, Macedo EC, Torloni MR, Silva AB, Prado GF.	Pharmacotherapy for sleep bruxism	Pharmalogical treatments with amitriptyline, bromocriptine, clonidine, propranolol, levodopa and tryptophan are possible, but the results of the efficacy of such interventions remain inconclusive
Raggi A, Mogavero MP, DelRosso LM, Ferri R.	Clonazepam for the management of sleep disorders	Clonazepam has been conducted, but with this treatment, attention should be paid to the drug's strong addictive potential and the possibility of respiratory distress
Cid-Verdejo R, Chávez Farías C, Martínez-Pozas O, Meléndez Oliva E, Cuenca-Zaldívar JN, Ardizzone García I, Martínez Orozco FJ, Sánchez Romero EA.	Instrumental assessment of sleep bruxism: A systematic review and meta-analysis	Studies considered the use of home portable EMG devices to diagnose sleep bruxism, but their reliability has yet to be confirmed
Jokubauskas L, Baltrušaitytė A.	Efficacy of biofeedback therapy on sleep bruxism: A systematic review and meta-analysis	Biofeedback therapy were tried to relieve bruxism- 5 days of stimulation resulted in an improvement in a form of calmer sleep pattern. While it did not provide pain relief, the nights went smoothly. Low- medium quality of evidence, need to be further researched.
Webb TR, Rajendran D.	Myofascial techniques: What are their effects on joint range of motion and pain? - A systematic review and meta-analysis of randomised controlled trials.	Manual physiotherapy in the form of fascial therapy reduces the sensation of pain, but the data concerning previous studies on this topic are characterized by high heterogeneity.

DISCUSSION

Although the exact pathomechanism of bruxism is undefined, methods have been developed for managing patients with bruxism. The most commonly cited causes of awake bruxism such as increased nervous tension, stress, anxiety disorders and chronic stressful situations are highly probable risk factors.¹⁰ The study proved an increased amount of cortisol in the saliva of adult patients diagnosed as suffering from bruxism compared to a control group. In children, no difference of clinical significance was noted. The probable cause of elevated cortisol levels in the saliva of bruxers is a reaction to stress, fear, frustration, anxiety.¹¹ Bruxers showed higher self-reported levels of stress, compared to non-bruxers; additionally, biomarkers such as epinephrine, norepinephrine, cortisol, dopamine and prolidase have been shown to be associated with sleep bruxism.¹² Bruxism has been shown to be common in patients with Down syndrome.¹³ Excessive clenching or grinding of teeth occurs in children and adults with neurodevelopmental disorders, but due to the wide heterogeneity of these disorders, their degree varies and studies need to be expanded in the future.¹⁴ One of the more commonly used treatments for bruxism are occlusal splints, and although studies do not show a statistically significant advantage in their use in treatment, they can be an effective tool to prevent further abrasion of teeth surfaces.¹⁵ Purified

botulinum toxin is a drug with a high safety profile and low adverse effects. It has a wide range of medical applications.¹⁶ It can be used to relax the masseter muscles leading to a reduction in muscle tension found in bruxers. Botulinum toxin produces effects of reducing bite force, as well as pain intensity lasting up to 24 weeks. A dose-effect relationship was observed: there was greater improvement in pain ailments in proportion to the dose of the drug used.¹⁷ At this point, the degree of recurrence of the teeth-clenching phenomenon and pain after botulinum toxin effects has stopped, has not been documented.¹⁸ Previously published studies indicate that the degree of teeth damage does not always correlate with the severity of bruxism.¹⁹ Due to its multifactorial origin and symptoms of varying degrees of severity, it is often impossible to determine the unequivocal cause of bruxism, and at the time of treatment, neither the dentist nor the patient is sure whether it is directed at the prevention of clashes and their potential worsening, or at the muscular pains that occur.²⁰ Pharmacological treatment for sleep clenching and/or grinding of teeth (amitriptyline, bromocriptine, clonidine, propranolol, levodopa and tryptophan) is possible, but the results of the efficacy of such interventions remain inconclusive, and the study's authors point to the need for expanded research in the future.²¹ A study of the treatment of bruxism with clonazepam has been conducted, but with this treatment, attention should be paid to the drug's strong addictive

potential and the possibility of respiratory distress.²² A review published in April 2024 considered the use of home portable EMG devices to diagnose sleep bruxism, but their reliability has yet to be confirmed and the results of research are of low quality. The authors suggest high specificity and sensitivity in diagnosis compared to polysomnography.²³ Biofeedback therapy is being attempted in patients suffering from bruxism. No improvement in the number of episodes of sleep bruxism was seen with hour-long contingent electrical stimulation, while the study noted that 5 days of stimulation resulted in an improvement in a form of calmer sleep pattern. While it did not provide pain relief, the nights went smoothly. Again, these are studies with low-medium quality of evidence, plus there is a lack of information on the long-term effects of biofeedback-type therapy.²⁴ Manual physiotherapy in the form of fascial therapy reduces the sensation of pain, but the data concerning previous studies on this topic are characterized by high heterogeneity.²⁵

CONCLUSIONS

Bruxism occurs in a significant segment of the population without a specific age group (from childhood through adulthood), and its periodic exacerbation and often unstable course over a lifetime perspective make treatment other than symptomatic treatment difficult. The causes appear to be so complex that treatment often goes beyond the scope of the dentist alone and requires broader interdisciplinary cooperation. Due to the unclear pathophysiology of bruxism, the type of treatment selected is often symptomatic. Botulinum toxin has the effect of reducing the severity of pain, but does not affect the protection of dental tissues. Guard splints are the only ones that seem to accomplish this task. Drug treatment currently has poor proven efficacy and also has many side effects. Biofeedback therapies require further expansion of research. EMS-type devices don't have the right amount of research to confirm their performance. Fascial physiotherapy can provide pain relief, but the research is of poor quality. Attention should also be paid to behavioral and psychological factors, especially in children. Patients with temporomandibular joint disorders in addition to bruxism appear to be a definite challenge because the aforementioned methods are not effective in treating them. Further research is needed on the etiology of bruxism, as well as the development of uniform recommendations for diagnosis and therapy.

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REFERENCES

- Manfredini D, Winocur E, Guarda-Nardini L, Paesani D, Lobbezoo F. Epidemiology of bruxism in adults: a systematic review of the literature. *J Orofac Pain*. 2013;27:99–110.
- Archer AB, Da-Cas CD, Valesan LF, Cunha TCA, Januzzi E, Garanhani RR, de La Torre Canales G, de Souza BDM. Prevalence of awake bruxism in the adult population: a systematic review and meta-analysis. *Clin Oral Investig*. 2023 Dec;27(12):7007–7018. doi: 10.1007/s00784-023-05302-w. Epub 2023 Oct 18. PMID: 37853263.
- Lobbezoo F, Ahlberg J, Glaros AG, Kato T, Koyano K, Lavigne GJ, et al. Bruxism defined and graded: an international consensus. *J Oral Rehabil*. 2013;40:2–4. <https://doi.org/10.1111/joor.12663> Access date: 15.05.2024
- Guo H, Wang T, Niu X, Wang H, Yang W, Qiu J, Yang L. The risk factors related to bruxism in children: A systematic review and meta-analysis. *Arch Oral Biol*. 2018 Feb;86:18–34. doi: 10.1016/j.archoralbio.2017.11.004. Epub 2017 Nov 11. PMID: 29149621.
- Gina Pingitore, Vickyann Chrobak, James Petrie, The social and psychologic factors of bruxism, *The Journal of Prosthetic Dentistry*, Volume 65, Issue 3, 1991, Pages 443–446, ISSN 0022-3913, [https://doi.org/10.1016/0022-3913\(91\)90240-W](https://doi.org/10.1016/0022-3913(91)90240-W). (<https://www.sciencedirect.com/science/article/pii/S002239139190240W> Access date : 15.05.2024
- Mortazavi N, Tabatabaei AH, Mohammadi M, Rajabi A. Is bruxism associated with temporomandibular joint disorders? A systematic review and meta-analysis. *Evid Based Dent*. 2023 Sep;24(3):144. doi: 10.1038/s41432-023-00911-6. Epub 2023 Jul 20. PMID: 37474733.
- Ribeiro-Lages MB, Martins ML, Magno MB, Masterson Ferreira D, Tavares-Silva CM, Fonseca-Gonçalves A, Serra-Negra JM, Maia LC. Is there association between dental malocclusion and bruxism? A systematic review and meta-analysis. *J Oral Rehabil*. 2020 Oct;47(10):1304–1318. doi: 10.1111/joor.12971. Epub 2020 Apr 21. PMID: 32246486.
- Knibbe W, Lobbezoo F, Voorendonk EM, Visscher CM, de Jongh A. Prevalence of painful temporomandibular disorders, awake bruxism and sleep bruxism among patients with severe post-traumatic stress disorder. *J Oral Rehabil*. 2022 Nov;49(11):1031–1040. doi: 10.1111/joor.13367. Epub 2022 Sep 18. Erratum in: *J Oral Rehabil*. 2024 May;51(5):911–914. PMID: 36056716; PMCID: PMC9825945.
- Goldstein RE, Auclair Clark W. The clinical management of awake bruxism. *J Am Dent Assoc*. 2017 Jun;148(6):387–391. doi: 10.1016/j.adaj.2017.03.005. PMID: 28550845.

10. G.J. Lavigne, S. Khoury, S.Abe, T. Yamaguchi, K.Raphael. Bruxism physiology and pathology: an overview for clinicians. <https://doi.org/10.1111/j.1365-2842.2008.01881.x> Access date: 15.05.2024
11. Fritzen VM, Colonetti T, Cruz MVB, Ferraz SD, Ceretta L, Tuon L, DA Rosa MI, Ceretta RA. LEVELS OF SALIVARY CORTISOL IN ADULTS AND CHILDREN WITH BRUXISM DIAGNOSIS: A SYSTEMATIC REVIEW AND META-ANALYSIS. *J Evid Based Dent Pract*. 2022 Mar;22(1):101634. doi: 10.1016/j.jebdp.2021.101634. Epub 2021 Aug 30. PMID: 35219468.
12. Polmann H, Réus JC, Massignan C, Serra-Negra JM, Dick BD, Flores-Mir C, Lavigne GJ, De Luca Canto G. Association between sleep bruxism and stress symptoms in adults: A systematic review and meta-analysis. *J Oral Rehabil*. 2021 May;48(5):621-631. doi: 10.1111/joor.13142. Epub 2021 Jan 28. PMID: 33377534.
13. Alam MK, Alsharari AHL, Shayeb MAL, Elfadil S, Cervino G, Minervini G. Prevalence of bruxism in down syndrome patients: A systematic review and meta-analysis. *J Oral Rehabil*. 2023 Dec;50(12):1498-1507. doi: 10.1111/joor.13563. Epub 2023 Aug 13. PMID: 37507203.
14. Kammer PV, Moro JS, Soares JP, Massignan C, Phadraig CMG, Bolan M. Prevalence of tooth grinding in children and adolescents with neurodevelopmental disorders: A systematic review and meta-analysis. *J Oral Rehabil*. 2022 Jun;49(6):671-685. doi: 10.1111/joor.13315. Epub 2022 Mar 21. PMID: 35218239.
15. Macedo CR, Silva AB, Machado MA, Saconato H, Prado GF. Occlusal splints for treating sleep bruxism (tooth grinding). *Cochrane Database Syst Rev*. 2007 Oct 17;2007(4):CD005514. doi: 10.1002/14651858.CD005514.pub2. PMID: 17943862; PMCID: PMC8890597.
16. Naumann M, Jankovic J. Safety of botulinum toxin type A: a systematic review and meta-analysis. *Curr Med Res Opin*. 2004 Jul;20(7):981-90. doi: 10.1185/030079904125003962. PMID: 15265242.
17. Chen Y, Tsai CH, Bae TH, Huang CY, Chen C, Kang YN, Chiu WK. Effectiveness of Botulinum Toxin Injection on Bruxism: A Systematic Review and Meta-analysis of Randomized Controlled Trials. *Aesthetic Plast Surg*. 2023 Apr;47(2):775-790. doi: 10.1007/s00266-023-03256-8. Epub 2023 Jan 24. PMID: 36694050.
18. Cheng Y, Yuan L, Ma L, Pang F, Qu X, Zhang A. Efficacy of botulinum-A for nocturnal bruxism pain and the occurrence of bruxism events: a meta-analysis and systematic review. *Br J Oral Maxillofac Surg*. 2022 Feb;60(2):174-182. doi: 10.1016/j.bjoms.2021.03.005. Epub 2021 Mar 24. PMID: 34955330.
19. Baba K, Haketa T, Clark GT, Ohyama T. Does tooth wear status predict ongoing sleep bruxism in 30-year-old Japanese subjects? *Int J Prosthodont*. 2004;17:39-44.
20. Lee A, He LH, Lyons K, Swain MV. Tooth wear and wear investigations in dentistry. *J Oral Rehabil*. 2012;39:217-25.
21. Macedo CR, Macedo EC, Torloni MR, Silva AB, Prado GF. Pharmacotherapy for sleep bruxism. *Cochrane Database Syst Rev*. 2014 Oct 23;2014(10):CD005578. doi: 10.1002/14651858.CD005578.pub2. PMID: 25338726; PMCID: PMC11033873.
22. Raggi A, Mogavero MP, DelRosso LM, Ferri R. Clonazepam for the management of sleep disorders. *Neurol Sci*. 2023 Jan;44(1):115-128. doi: 10.1007/s10072-022-06397-x. Epub 2022 Sep 16. PMID: 36112279.
23. Cid-Verdejo R, Chávez Fariás C, Martínez-Pozas O, Meléndez Oliva E, Cuenca-Zaldívar JN, Ardizzone García I, Martínez Orozco FJ, Sánchez Romero EA. Instrumental assessment of sleep bruxism: A systematic review and meta-analysis. *Sleep Med Rev*. 2024 Apr;74:101906. doi: 10.1016/j.smrv.2024.101906. Epub 2024 Jan 21. PMID: 38295573.
24. Jokubauskas L, Baltrušaitytė A. Efficacy of biofeedback therapy on sleep bruxism: A systematic review and meta-analysis. *J Oral Rehabil*. 2018 Jun;45(6):485-495. doi: 10.1111/joor.12628. Epub 2018 Apr 11. PMID: 29577362.
25. Webb TR, Rajendran D. Myofascial techniques: What are their effects on joint range of motion and pain? - A systematic review and meta-analysis of randomised controlled trials. *J Bodyw Mov Ther*. 2016 Jul;20(3):682-99. doi: 10.1016/j.jbmt.2016.02.013. Epub 2016 Mar 2. PMID: 27634094.